Integration of electron, laser and ion microprobe techniques to create an open source digital mineral library of Western Australia

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Accessory minerals contain trace element signatures that can be used to elucidate the physiochemical history and genesis of rock formations, information which has utility in exploration targeting. A crucial issue for exploration is discriminating anomalous mineral chemistry signatures from background levels. This work reports on a project designed to determine the background trace element abundances for key Western Australian lithologies via analysis of 150 heavy mineral concentrate residues from the GSWA SHRIMP U-Pb geochronology program.

The project team developed a workflow that integrates a laboratory information management system (LIMS) with the IGSN sample registry, TIMA FE-SEM automated mineralogy technology, and SHRIMP U-Pb and ELA-ICP-MS data outputs. Zircon, monazite, titanite, rutile, apatite and many other accessory minerals in polished mounts are rapidly identified (up to 20,000 grains/hr) and spatially registered for subsequent trace element analysis by laser or ion microprobe. Instrument outputs are linked to the LIMS metadata registry and are acessible via the AuScope Discovery Portal (portal.auscope.org).

Determination of rutile trace element contents is an example of the practical importance of this project, as Doyle *et al*. [1] have recently reported that W-rich rutile with a specific age range (2521 ± 5 Ma) is an indicator of gold mineralisation at the Tropicana gold deposit.

[1] Doyle *et al*. (2015). *Econ Geol* **110**, 355-386.